

(11) Husband: The tree might have fallen on my office.

Me: The tree could not have fallen on your office.

It is not true that the tree might have fallen on your office.

Semantic puzzle

The statements seem contradictory. But in their contexts, both statements seem true.

Semantic, logical, and practical question

Is my husband's argument valid? Should we cut down the other tree?

(12) The Ranch

John is an expert petroleum geologist and investor. In 2003, he finds a ranch property in Ecuador and analyzes its geology very carefully. He applies best-practice methodology for petroleum prospecting. He decides the ranch has a good probability of containing a large oil reserve, and on December 1, 2003 buys the property together with a partner. Unfortunately, expensive drilling establishes that there is only worthless salty water under the ranch. The partner's opinion on June 1, 2006:

We bought a ranch which might well have contained a significant oil reserve. But unfortunately there is no oil on this ranch. Let's sell it and move on to the next project.

(13) We bought a ranch which might have contained an oil reserve.

In the base world w_0 , there is only salt water under the ranch, both in 2006 and at the purchase time of 01.12.2003.

So there is no branch w_1 from $\langle w_0, 01.12.2003 \rangle$ and time t following 01.12.2003 such that the ranch contains an oil reserve at w_1, t . (Assume oil never will form on the ranch, even in millions of years.)

On Condoravdi's semantics using a metaphysical modal base, the sentence is false w.r.t. $\langle w_0, 01.06.2006 \rangle$.

Therefore the partner's statement, if it is true, does not use a metaphysical modal base.

(14) Me: It is not the case that the tree might have fallen on the house.

t_1 is a time right before the storm.

At $\langle w_0, t_1 \rangle$ the state of the tree trunk (the rot inside) is such that when the tree falls, it will fall away from the house onto the driveway.

So there is no branch w from $\langle w_0, t_1 \rangle$ and time t_2 following t_1 such that at $\langle w, t_2 \rangle$ the tree falls on the house.

So my statement (14) is true on the metaphysical semantics.

This is good, because my statement is intuitively true in its context.

My statement is consistent with the Mondadori-Condoravdi analysis.

(15) Husband: The tree might have fallen on my office.

By the same reasoning, my husband's statement is false if it exploits a metaphysical modal base indexed by t_1 .

This is bad, because my husband's statement is intuitively true in its context.

Also, my husband's argument strikes me as convincing. How could it be, if his statement is false?

Diagnosis Mondadori and Condoravdi are wrong in saying that such readings for *might have* always use a metaphysical modal base.

(16) The Philosopher and the Linguist

My friend David who is a philosopher of physics developed a deterministic version of modern physics. In this theory, there are no worlds w_1 and w_2 which are identical up to times t_1 and t_2 , but are different afterwards. He published a paper arguing that this theory is consistent with everything scientists know.

Although I don't have an opinion on that sort of thing, as a theoretical exercise, I decided to base my research in natural language semantics and pragmatics on my friend's theory of physics. In particular, when I worked with possible worlds, the worlds were the deterministic worlds of my friend's theory.

When I got to working on *might have*, there was a problem. In my friend's space of worlds and times, a metaphysical modal base is always trivial. It consists of worlds which are identical throughout time. Using the Mondadori-Condoravdi analysis, I was able to give a semantic proof for the following inference involving truth values of sentences.

False Ljubo was the world champion of chess in 1978.

False Ljubo might have been the world champion of chess in 1978.

Reaction 1

The grammar and semantics of English have metaphysical presuppositions which happen to be inconsistent with David's theory of physics. This is a curious result of natural language semantics, not any kind of problem.

Reaction 2

It's strange for natural language semantics to constrain the space of worlds in this way. I'd like to have a theory of semantics which is compatible with any reasonable scientific theory. This makes me suspicious about the Mondadori-Condoravdi analysis.

(17) Chess title scenario

Ljubo lost the title match to Karpov in 1977. When he worked on strategies throughout the 1970s, he explored strategies which Karpov was also examining. Since Karpov was in important respects more capable, Ljubo lost. But later analysis

showed that if he had started working in 1975 on the strategy which later became known as the Mexican Defense (and which Ljubo became a master of), he might well have beaten Karpov.

True In 1975, Ljubo might still have won.

True In 1975, Ljubo could still have won.

(18) Extended scenario

Ljubo in fact settled on his strategies (the ones that Karpov also examined) in the early 1970s. He was a very methodical person who never made major changes in strategy.

False (?) In 1975, Ljubojevic might still have won.

False (?) In 1975, Ljubojevic could still have won.

False, because Ljubo never changes strategy.

The extended scenario shows that a shift in contextual assumptions can change the truth value of the *might have* sentence. Presumably, there is no way of shifting the way the base world actually branches.

(19) Another general objection

According to Mondadori and Condoravdi, the truth of a *might have* sentence depends on how the base world branches. (Or technically, what the metaphysical alternatives to the base world are at various times.) Speakers don't have much information about this, because speakers don't know what world they are in. So it's hard to see how using *might have* sentences on the metaphysical reading is ever supported, or how using such sentences conveys useful information.

3. Circumstantial analysis

(20) Sketch of analysis

The Trees, Ranch, and Chess Match data suggest circumstantial or epistemic modal bases, rather than metaphysical ones.

A *circumstantial* modal base (Kratzer) is a conjunction of "relevant" facts about the base world.

A *fact* about a world is a proposition which the world is an element of.

We get different truth values for modal sentences with circumstantial bases by choosing different sets of facts. Semantically, the choice is free. Pragmatically, the choice is influenced by conversational context and the aims of speakers (Kratzer).

(21) My facts in the Trees scenario

F1 There is a storm in our yard with such-and-such wind velocity.

F2 The tree that fell has rot in such-and-such precise position within the trunk.

F3 Facts about the top of the tree (how large it is, etc.)

F4 Location of my husband's office relative to tree.

F5 Physical theory of tree motions under the influence of wind.

F6 The tree falls. (*maybe*)

In the conjunction of these propositions, there is no world where the tree falls on my husband's office. So the *tree might have fallen on the office* is false.

(22) Husband's facts

The same, with F2 replaced by

G2 The tree has such-and-such amount of rot within the trunk (without specifying location within the trunk).

In the Husband's modal base (the conjunction of his facts), there *are* worlds where the tree falls on his office. So the *tree might have fallen on the office* is true.

(23) Realistic modal base (Kratzer)

A realistic modal base is one which contains the base world. As defined above, circumstantial modal bases are realistic.

(24) The Ranch (extended scenario)

The geological tests John uses give wildly incorrect results on rare occasions (say one time in ten thousand). The tests are not repeated because they are expensive, and because the errors are so rare. In this case, purely by chance, several measurements were wildly incorrect. As a result, some of the propositions in John's geological report are false in the base world. The measurement errors were discovered in the drilling phase of the work. Can John's partner still truthfully say:

We bought a ranch which might well have contained a significant oil reserve. But unfortunately there is no oil on this ranch. Let's sell it and move on to the next project.

(25) Revised scenario

John falsified all of the test results, and never doing any real geological tests. He stole the money for the tests, and wanted the project to go ahead because he could steal more money in the drilling phase.

(26) Tentative idea

It is sufficient for a proposition determining the modal base to be obtained by reliable means. It does not have to be true. The modal base does not have to be realistic in the technical sense, though it is still "reality-oriented".

Note: according to Kratzer, *epistemic* modal bases are also realistic. Lexical decompositions from Abusch (2006).

$$x \text{ know } p \equiv p \wedge x \sqrt{\text{know}} p$$

An epistemic modal base is realistic, but an $\sqrt{\text{epistemic}}$ modal base doesn't have to be realistic.

- (27) If a tree falls in a forest and nobody hears it, does it ~~make a sound~~ create a modal base?

The two trees are in a part of our forest reserve which we never visited before. The tree fell away from a plantation of endangered orchids. We find it several months after it fell. The facts about the rot are as before.

The tree could have fallen on the orchids. Let's cut down the other tree.

4. The time argument of the modal

- (28) Ljubo might have been world champion now.

Uttered a month after the match which Ljubo lost.

- (29) [have [might [Fut [Ljubo be world champion now]]]]

The metaphysical analysis uses a metaphysical modal base relative to $\langle w_0, t_1 \rangle$, where t_1 is a time preceding u . This base $M(w_0, t_1)$ consists of all worlds which are identical to w_0 up to t_1 .

The metaphysical semantics requires that there is some world w in $M(w_0, t_1)$ such that Ljubo is world champion in w at the utterance time u .

Since *have* shifts evaluation time back from u , there is a direct link between the metaphysical analysis and the scope-switch hypothesis.

What is the corresponding link if the MB is circumstantial?

- (30) Propositions true in 1975

F1 Karpov know nothing about the Mexican Defense

F2 Ljubo have such-and-such mental capacities

...

These propositions are true in 1975 in w_0 , and so can be intersected to form a MB which is realistic relative to $\langle w_0, 1975 \rangle$. Maybe this reality constraint is the constraint associated with the time argument of the modal.

- (31) # Ljubo might be world champion now.

- (32) Propositions true in 1977

F1' Karpov know nothing about the Mexican Defense two years before

F2' Ljubo have such-and-such mental capacities two years before

...

- (33) ? Ljubo, you're a blockhead. You could be world champion now! Why didn't you work on the Mexican defense?

Ljubo, you're a blockhead. You might be world champion now! Why didn't you work on the Mexican defense?

Iatridou on the Past the Possible

- (34) It is possible that John stole the tapes.

- (35) #It was possible that John stole the tapes.

- (36) John and his partner bought a ranch.

It was possible that it contained an oil reserve.

It is possible that it contained an oil reserve.

It is possible that it contains an oil reserve.

- (37) It was likely that it contained an oil reserve.

It was practically certain that it contained an oil reserve.

(Can assume criteria of best-practice oil exploration and available information.)

- (37.5) It was possible that John would win.

Iatridou and von Stechow on Epistemic Containment

- (38) Most of our students must be home by now.

a. must > most of our students

b. *most of our students > must

- (39) Half of you are healthy. #But everyone may be infected.

- (40) *Epistemic Containment Principle*

A quantifier can not scope over an epistemic modal.

- (41) Each student MIGHT have left. But it is clear that there are some students in the building.

- (42) Every linguist listed here COULD be reviewer #3.

Every linguist listed here MIGHT be reviewer #3.

- (43) The poisoned dessert

At a party, a cake made with berries is served. After all the guests have left, it is discovered that the berries are a certain kind of poisonous wild berries. Fortunately ordinary salt is an antidote. It is our responsibility to contact the guests as soon as possible, to give them a chance to survive. We have only their home telephone numbers.

Each of the guests MIGHT be home already. So we have to call all of the guests at home right away.

Every guest MIGHT be home already.

References

- Abusch, Dorit (1998) "Generalizing Tense Semantics for Future Contexts". In Susan Rothstein, ed., *Events and Grammar*, 13-33. Dordrecht:Kluwer
- Abusch, Dorit, (2004) "On the Temporal Composition of Infinitives". In *The Syntax of Time*, edited by Jacqueline Gueron and Jacqueline Lecarme, MIT Press.
- Abusch, Dorit (2006) "Triggering from Alternative Sets and Projections of Pragmatic Presuppositions". Ms. Cornell University.
- Condoravdi, Cleo (2002) "Temporal Interpretation of Modals: Modals for the Present and for the Past". In *The Construction of Meaning*, edited by David Beaver, Luis D. Cassillas Martinez, Brandy Z. Clark and Stephan Kaufmann. Stanford: CSLI.
- Iatridou, Sabine (1990) "The Past, the Possible, and the Evident". *Linguistic Inquiry*, 21 pp.123-129.
- Iatridou, Sabine (2000) "The Grammatical Ingredients of Counterfactuality", *Linguistic Inquiry* 31(2) pp. 231-270.
- Kratzer, Angelika (1981) "The Notional Category of Modality". In *Words, Worlds, and Contexts. New Approaches in Word Semantics*, edited by H.J. Eikmeyer and H. Rieser, pp. 38-74. Berlin: de Gruyter.
- Kratzer, Angelika (1991) "Modality". In *Semantics: An international handbook of Contemporary Research*, edited by Arnim von Stechow and Dieter Wunderlich, pp. 639-650. Berlin:de Gruyter.
- Mondadori, Fabrizio (1978) "Remarks on Tense and Mood: The Perfect Future". In Franz Guenther and Christian Rohrer, eds., *Studies in Formal Semantics: Intensionality, Temporality, Negation* 223-248. Amsterdam: North Holland.
- von Fintel, Kai and Iatridou, Sabine (2003) "Epistemic Containmentment". *Linguistic Inquiry* 34(2): 173-198
- Von Stechow, Arnim (2005) "Temporal Orientation of Modals and Attitudes (and Covert Temporal Operators)". Handout of talk given in Cornell April, 2005.
- Von Stechow, Arnim (2005) "Interpretiertes Tempus: Temporal Orientierung von Modalen". (Version August 2005)
- Stowell, Tim (2004) "Tense and Modals" In *The Syntax of Time*, edited by Jacqueline Gueron and Jacqueline Lecarme, MIT Press.